

Claims

1. A process for purifying a radiolabelled product which comprises use of a solid-support bound scavenger group of formula (IV):

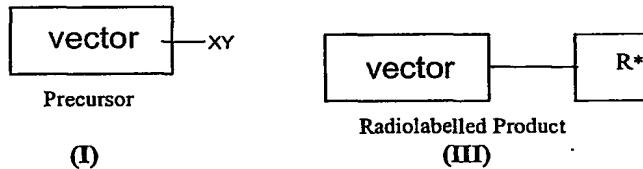
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wherein Z is a scavenger group and SP is a solid support.

10 2. A process comprising the steps of:

(a) contacting a solution-phase mixture of a radiolabelled product of formula (III) and excess precursor of formula (I):



15 wherein XY is a functional group and R\* is a radioisotope or radiolabelled portion; with a compound of formula (IV):



20 wherein Z is a scavenger group;

such that the compounds of formulae (IV) and (I) may form a covalent bond to each other;

25 (b) separation of purified radiolabelled product of formula (III) in the solution phase.

3. A process according to claim 1 or 2 wherein the scavenger group Z is an

isocyanate, isothiocyanate, thiol, hydrazine, hydrazide, aminoxy, 1,3-dipole, aldehyde or ketone.

4. A process according to any of claims 1 to 3 comprising the steps of:

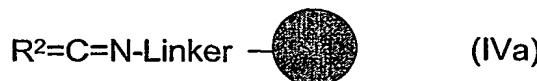
5 (a) contacting a solution-phase mixture of a radiolabelled product of formula (IIIa) and excess precursor of formula (Ia):



wherein  $\text{R}^1$  is  $\text{C}_{1-6}$  alkyl and  $\text{R}^*$  is  $^{[11]\text{C}}\text{-C}_{1-6}$  alkyl, such as  $^{11}\text{CH}_3$  or  $^{[18]\text{F}}$ fluoro  $\text{C}_{1-6}$  alkyl or  $^{[18]\text{F}}$ fluoro  $\text{C}_{6-12}$  aryl;

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with a compound of formula (IVa):



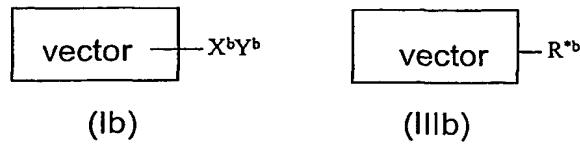
15 wherein  $\text{R}^2$  is oxygen or sulphur  
 such that the compounds of formulae (IVa) and (Ia) may form a covalent bond to each other; and

20 (b) separation of purified radiolabelled product of formula (IIIa) in the solution phase.

5. A process according to any of claims 1 to 3 comprising the steps of:

(a) contacting a solution-phase mixture of a radiolabelled product of formula (IIIb) and excess precursor of formula (Ib):

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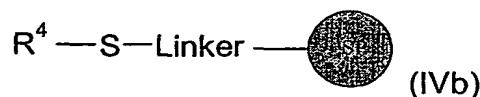
wherein either

(i) the functional group  $-X^bY^b$  in the compound of formula (Ib) is  $-OSO_2R^3$  wherein  $R^3$  is  $C_{1-15}$  alkyl or  $C_{1-10}$  alkylaryl and  $R^3$  is optionally substituted by halo (preferably fluoro), for example  $R^3$  is methyl, para-toluene, trifluoromethyl, and  $R^{*b}$  in the compound of formula (IIIb) is a radiohalogen such as radiofluoro (for example  $^{18}F$ ) or radioiodo (such as  $^{123}I$ ,  $^{124}I$ , or  $^{125}I$ ) or radiobromo (such as  $^{76}Br$ ); or

5 (ii) the functional group  $-X^bY^b$  in the compound of formula (Ib) is  $-C(O)CH_2Cl$  and  $R^{*b}$  in the compound of formula (IIIb) is  $-S-L^b-nF$  wherein  $L^b$  is a  $C_{1-30}$  hydrocarbyl linker group optionally including 1 to 10 heteroatoms; and

10  $nF$  is a radioisotope of fluorine such as  $^{18}F$ ;

with a compound of formula (IVb):



15

wherein  $R^4$  is hydrogen;

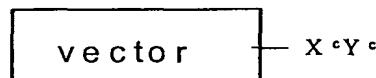
such that the compounds of formulae (IVb) and (Ib) may form a covalent bond to each other;

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(b) separation of purified radiolabelled product of formula (IIIb) in the solution phase.

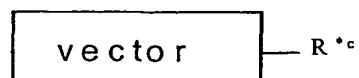
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6. A process according to any of claims 1 to 3 comprising the steps of:  
 (a) contacting a solution-phase mixture of a radiolabelled product of formula (IIIc) and excess precursor of formula (Ic):



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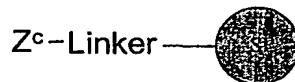
(Ic)



(IIIc)

wherein the functional group  $-X^cY^c$  in the compound of formula (Ic) is an aldehyde or ketone and  $R^{*c}$  in the compound of formula (IIlc) is  $=N-W$ -Linker-F where W is  $C_{1-15}$  alkyl or  $C_{7-15}$  aryl, with a compound of formula (IVc):

5



(IVc)

wherein  $Z^c$  is selected from  $-NH_2$ , hydrazine, hydrazide, aminoxy,

10 phenylhydrazines, semicarbazide, or thiosemicarbazide;

such that the compounds of formulae (IVc) and (Ic) may form a covalent bond to each other; and

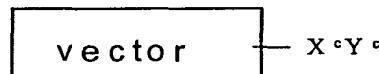
(b) separation of purified radiolabelled product of formula (IIlc) in the solution

15 phase.

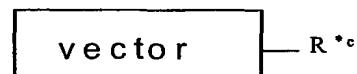
7. A process according to any of claims 1 to 3 comprising the steps of:

(a) contacting a solution-phase mixture of a radiolabelled product of formula (IIlc) and excess precursor of formula (Ic):

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(Ic)



(IIlc)

wherein the functional group  $-X^cY^c$  in the compound of formula (Ic) is  $-OSO_2R^3$

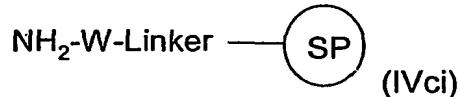
25 wherein  $R^3$  is  $C_{1-15}$  alkyl or  $C_{1-10}$  alkylaryl and  $R^3$  is optionally substituted by halo

(preferably fluoro), for example  $R^3$  is methyl, para-toluene, trifluoromethyl and  $R^{*c}$

in the compound of formula (IIlc) is  $=N-W$ -Linker-F where W is  $C_{1-15}$  alkyl or  $C_{7-15}$

aryl, with a compound of formula (IVci):

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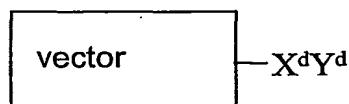
where W is selected from C<sub>1-15</sub> alkyl or C<sub>7-15</sub> aryl, -NH-, -NH-CO- or -O- ; such that the compounds of formulae (IVci) and (Ic) may form a covalent bond to each other; and

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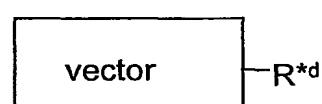
(b) separation of purified radiolabelled product of formula (IIIc) in the solution phase.

8. A process according to any of claims 1 to 3 comprising the steps of:

10 (a) contacting a solution-phase mixture of a radiolabelled product of formula (IIId) and excess precursor of formula (Id):



(Id)

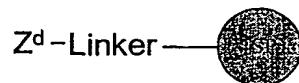


(IIId)

15 wherein the functional group  $\text{X}^d\text{Y}^d$  in the compound of formula (Id) is an amine, hydrazine, hydrazide, aminoxy, phenylhydrazine, or semicarbazide, thiosemicarbazide group and  $\text{R}^{*d}$  in the compound of formula (IIId) is  $=\text{CH-Linker-F}$  where the linker comprises an alkyl, aryl or polyethylene glycol component;

20

with a compound of formula (IVd):



(IVd)

25

wherein  $\text{Z}^d$  is an aldehyde or ketone moiety;

such that the compounds of formulae (IVd) and (Id) may form a covalent bond to each other; and

(b) separation of purified radiolabelled product of formula (IIId) in the solution phase.

9. A process according to claim 8 wherein the compound of formula (IVd) has a 5 ketone scavenging group based on a ring-opening metathesis polymerisation (ROMP) polymer backbone.

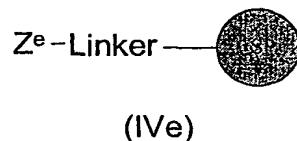
10. A process according to any of claims 1 to 3 comprising the steps of 10 (a) contacting a solution-phase mixture of a radiolabelled product of formula (IIIe) and a by-product (VIIe):



15 wherein the by-product (VIIe) contains an unwanted double bond, formed by an elimination side-reaction, and R\*^e in the compound of formula (IIIe) is radiohalo, particularly [<sup>18</sup>F]fluoro;

with a compound of formula (IVe):

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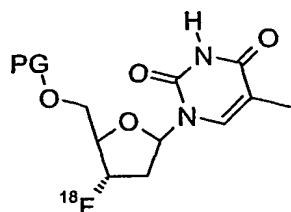
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wherein Z^e is a 1,3-dipole such as  $-N=N^+=N^-$  or  $-C\equiv N^+-O^-$  such that the compounds of formula (IVe) and (VIIe) may form a covalent bond to each other; and

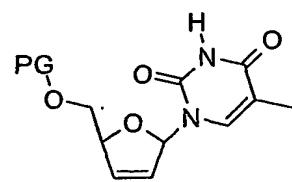
(b) separation of purified radiolabelled product of formula (IIIe) in the solution phase.

30 11. A process according to claim 10 wherein the compound of formula (IIIe) and

(VIIe) are:



(IIIe)

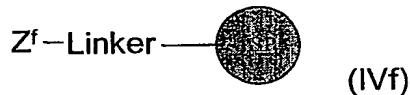


(VIIe)

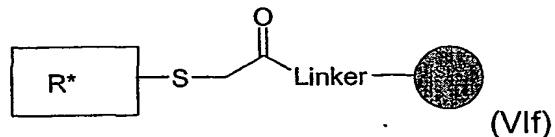
wherein each PG is hydrogen or a hydroxyl protecting group (suitably tert-butoxycarbonyl, benzyl, triphenylmethyl, or dimethoxytriphenylmethyl).

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12. A process according to claim 1 which comprises use of a compound of formula (IVf):



10 wherein  $Z^f$  is  $\text{Cl}-\text{CH}_2-\text{CO}-$  or another haloacetyl containing moiety for removal of unreacted radiolabelling agent containing a thiol moiety from a reaction mixture resulting in formation of a compound of formula (VIf):



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wherein  $R^*$  is a radioisotope or radiolabelled portion.

13. An automated radiosynthesis apparatus, or a cassette therefor, comprising a vessel, such as a cartridge, containing a solid-support bound scavenger group of 20 formula (IV), (IVa), (IVb), (IVc), (IVd), (IVe), or (IVf) as defined in claims 1 to 12.